

REMARKS

Claims 1-3, 5-18, 20-27, 29-30 and 45-46 are pending in the application.

Independent claim 1 is amended above to incorporate the feature of dependent claim 19 and is also amended to make it clear that the at least two metals are capable of participating in an alloying reaction to give an exothermic reaction. Basis for that amendment may be found, *inter alia*, at page 6, lines 8 to 18 of the original specification.

Claim 19 is cancelled from the application without prejudice and claim 20 is amended to depend upon claim 1.

New independent claim 46 is added to the application above as well.

No new matter has been added to the application by way of these specification and claim amendments.

The Applicant thanks the examiner David Parsley for holding a telephonic interview on August 20, 2010 with A. Blair Hughes to discuss proposals for amending application claim 1 to distinguish it from the cited prior art. No agreement regarding ultimate claim patentability was reached.

I. THE OBVIOUSNESS REJECTION TRAVERSE

Claims 1-3, 13, 19-27 and 29-30 stand rejected for being anticipated by U.S. Patent No. 4,766,813 to Winter et al. in view of Nielson et al. (USPA 2004/0020397) or alternatively in view of Jacoby et al. (USPA 2002/0017214). Independent claim 1 is amended above to include the feature of claim 19, wherein at least one further metal is added to the composition. In addition, claim 1 – prior to its amendment is non-obvious and patentable for reasons which cause all pending claims to be patentable over the cited prior art.

A. Amended Independent Claim 1 Is Non-Obvious Over The Cited Art

As explained above, in Applicant's reactive liner the at least two metals generate additional energy through the alloying reaction. However, such reactive metals tend to be of a lower density and strength, and hence it is desirable to add "a further metal is to provide additional mechanical strength to the liner and thus to increase the penetrative power of the jet", as explained on page 9, third paragraph of the PCT specification.

Since independent claim 1 is amended above to include the feature of claim 19, the examiner's rejection of claim 19 will therefore be traversed below.

Regarding independent claim 1, it is the examiner's position that Winter discloses all of the claim features except for the use of a compacted particulate composition of at least two metals. The examiner relies upon each of Nielson and Jacoby for disclosing a shaped charge liner made of a compacted particulate composition of at least two metals. Regarding claim 19, the examiner takes the position that Winter discloses the use of at least one further metal that is not capable of exothermic reaction upon activation at col. 3, lines 20-45.

The examiner's obviousness rejection is traversed at least because the cited prior art does not disclose or suggest the specific synergistic combination of metal components as now claimed – at least two of which give an exothermic reaction upon activation and at least one further one that is inert but assists with penetration. In particular, the examiner's reliance upon Winter at col. 3, lines 20-45 for disclosing this teaching is misplaced. The cited excerpt of Winter discloses a composite liner having an outer layer formed from a wrought material (substrate **32**) and an inner layer (coating **30**) formed from a deposited material. (See Winter at col. 3, lines 21-26). The outer layer 32 is clearly not a compacted particulate composition as claimed. The inner layer 30 is a deposited material having a fine grain structure, and while that might be regarded as being formed of grains or particles, it is certainly not a compacted particulate material. Therefore, if there is any analogy to be drawn between the claimed liner and the Winter liner, it would be between the inner deposited material of Winter and the claimed compacted particulate of the claimed liner. In other words, one skilled in the art at the time of the invention would not view the composition of the Winter outer layer 32 as having any relevance whatsoever to the composition of the particulate inner layer 30 at least because the functions of the outer layer of Winter and the particulate inner layer of Winter and the particulate inner layers of Nielsen and Jacoby are very different.

This distinction is important because the Winter excerpt cited by the examiner for rendering the claimed specific metal particulate combination obvious only discusses the possible metals that may be included in the outer wrought/ductile metal layer 32 of Winter (see claim 11). The cited excerpt is silent about the composition of the inner particulate material. As a result, the cited excerpt of Winter does not, as the examiner maintains, disclose a three metal particulate composition having the recited properties as we claim.

In addition, neither Nielson nor Jacoby when combined with Winter disclose or suggest the specific claimed synergistic combination of at least two metals to generate the exothermic

reaction as well as a further (inert) metal to assist with depth of penetration, as argued in our first response. For at least these reasons, claims 1-3, 5-18, 20-27, 29-30 and 45 are non-obvious and patentable.

B. The Examiner's Motivation For Combining The References Is Illogical

All claims are further non-obvious and patentable because the examiner's recited motivation for combining the references is illogical. In particular, the examiner's motivation for combining the references is based upon the premise that Winter discloses a "pressed particulate composition" (See Examiner's statement on page 3, lines 3-4 of the June 7th 2010 Office Action). However, the Applicant maintains its position that Winter does not disclose even a "pressed particulate composition" (Note this claim wording has now been superseded.) That term has a well recognized meaning in the art to a person skilled in the art at the time of the invention such as a powder metallurgist, and it is inconceivable that such a person would consider electrodeposited, sputtered or chemical vapour deposited coatings of the inner liner of Winter to be a "pressed particulate material". For this reason as well, the examiner's obviousness rejection must be withdrawn.

C. There Is No Prima Facie Case Of Obviousness

Yet another reason why the claimed invention is non-obvious is because the examiner has not made out a prima facie case of obviousness. The presently claimed inventions are drawn to a "reactive oil and gas well shaped charge liners". None of the cited prior art uses a reactive liner based on an alloying reaction as is required by the claims. Indeed, Winter is not directed to a "reactive oil and gas well shaped charge liner" as required by claim 1 (or new independent claim 46) and the examiner appears not to appreciate this significant shortcoming of the reference.

In the past, shaped charge liners were inert – as explained on page 3, line 20 onwards of our PCT specification, "The kinetic energy of the jet from a shaped charge is provided exclusively by the detonative pressure of the explosive...Once the jet is in motion there is no further energy available from the system". The present invention provided one of the first types of reactive liners i.e. as indicated on page 4, line 7: "a shaped charge liner whose jet can provide additional energy after the detonative event".

The present invention accomplishes this by harnessing the energy generated when a 3/2 electron concentration intermetallic alloy compound is formed by an alloying reaction. (See

specification at page 5, line 35 to page 6, line 21; page 12, line 22 to page 13, line 2). Applicant found 3/2 compounds gave out especially high energy outputs in practice when fired as shaped charge liners. Claim 1 has been amended to emphasize this aspect of the invention and now recites:- “of the at least two metals, which are and is capable, in operation, of participating in an alloying reaction to give an exothermic reaction upon activation of an associated shaped charge.”.

Neither Winter nor Jacoby relate to a “reactive” liner, as required by claim 1. Winter is merely an example of an earlier inert type liner where they try to improve jet performance by the use of a highly uniform grain structure for the deposited inner layer. Jacoby also relates merely to an inert liner; in that case, they are modifying the shape of the liner to try to improve performance.

Nielson does relate to a reactive liner, but that prior art document is based upon the use of an oxidizing agent reacting with the metal to provide additional energy output. See the following paragraphs of Nielson:-

[0010] The present invention relates to a reactive material comprising at least one metal filler and an oxidizing agent.

[0021] The reactive material of the present invention may be used as a reactive liner **8** in penetrating (shape-charge) warheads **2** and in high strength reactive fragments **12** in

[0022] The oxidizing agent may provide strength to the reactive material so that the reactive material survives detonation of the warhead. In addition, the oxidizing agent may be a strong oxidizer so that secondary reactions, such as incendiary reactions, occur when the reactive material penetrates its target. The incendiary reactions may also be due to afterburning of the metal filler, which is caused by a reaction between the metal filler and atmospheric oxygen. The oxidizing agent may accelerate the rate of metal filler/atmospheric oxygen reaction. Preferably, the oxidizing agent is a fluoropolymer or fluoroelastomer with a high fluorine content, a low melt temperature, and a high mechanical strength. More preferably, the oxidizing agent is a thermoplastic fluoropolymer.

Nielson therefore teaches a reactive liner based upon an oxidizing reaction of a fluoropolymer with the metal liner and hence teaches away from the present invention where the additional energy instead comes from an alloying reaction of 3/2 compounds, as in accordance with the

present invention. Accordingly, none of the cited prior art teaches or suggests the solution of the present invention and all claims are non-obvious and patentable over the cited art.

II. NEW INDEPENDENT CLAIM 46

New independent claim 46 is added to the application above. Independent claim 46 does not include the third metal limitation of claim 1. Instead, it includes the feature whereby the shaped charge liner does not include a fluoropolymer oxidizing agent. Negative limitations are permissible in a claim so long as they do not create issues of indefiniteness and undue breadth and so that obviousness is avoided. The negative limitation included in new claim 46 finds more than adequate support in the specification. In particular, the specification does not disclose liners that include fluoropolymers much less fluoropolymer oxidizing agents. Therefore, the specification clearly apprises one skilled in the art at the time of the invention that the claimed liners do not include fluoropolymer oxidizing agents.

Claim 46 is patentable over the cited prior art and in particular, Winter in combination with Nielson because Nielson only discloses liner compositions that include fluoropolymer oxidizing agents. Claim 46 is patentable over the combination of Winter with Jacoby at least because the combination does not disclose “at least two metals are provided in respective proportions calculated to give an electron concentration of 1.5.

CONCLUSION

All pending application claims are believed to be patentable for at least the reasons recited above. Favorable reconsideration and allowance of all pending claims is, therefore, courteously solicited.

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